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THE VELVET-STEMMED COLLYBIA—A WILD WINTER
MUSHROOM.

F. C. STEWART.



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THE VELVET-STEMMED COLLYBIA

(From an autochrome plate prepared by W. R. Fisher of the Department of
Plant Pathology, New York State College of Agriculture)



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THE VELVET-STEMMED COLLYBIA — A WILD WINTER MUSHROOM.

F. C. STEWART.

SUMMARY.

The velvet-stemmed Collybia, or winter mushroom, is a common wild mushroom which should be better known and more generally used for food. It has a reddish yellow cap, white gills and velvety, brown stem. It grows in dense clusters on stumps, logs and buried wood. Its principal season is October, November and May but it may be found, also, in spells of mild weather during winter. The caps may freeze and thaw several times without injury.

In flavor and consistency it is excellent. The viscosity of the caps, which makes them disagreeable to handle and difficult to clean, is the most objectionable feature of the fungus. The caps possess a remarkable capacity for the absorption of water. In the presence of moisture shriveled caps revive.

Owing to the fact that it grows in cold weather when other fleshy fungi are scarce there is little danger of confusing the velvet-stemmed Collybia with poisonous species. For the same reason it is not often seriously infested with worms. However, it is sometimes attacked by a white mold and the caps are frequently mutilated by slugs.

Preparation for cooking consists in the removal of the stems, picking off adhering leaves and blades of grass, and washing. Peeling of the caps is unnecessary.

A good way to cook the caps is to boil them for thirty minutes, then fry for fifteen minutes in butter, oleomargarin or bacon fat and season with salt and pepper. They may be served separately or on toast.

Any surplus which it is desired to preserve for future use may be dried. For this purpose, reasonably clean caps should be selected. The stems and adhering rubbish should be removed, but the caps not washed. Washed caps do not dry well. The washing should be postponed until just before the caps are to be cooked.

FLESHY FUNGI.

The fields, pastures and woods of New York abound in fleshy fungi of many kinds. They are called mushrooms, toadstools and puffballs. It is well known that a considerable number of these are edible and that some of them are of excellent quality. It is known, also, that some kinds are deadly poisonous. Owing to the difficulty of distinguishing the edible kinds from the poisonous ones comparatively few persons use wild mushrooms for food to any great extent. Vast quantities of good food of this kind go to waste every year.

This is regrettable, but appears to be very difficult to avoid. Even if they possessed the inclination the majority of people do not have the time necessary to acquaint themselves with the numerous kinds of mushrooms and toadstools. Unfortunately, none of the popular tests of edibility such as peeling, blackening of silver, etc., are dependable. There is no simple test which is of general application. He who would eat fleshy fungi in safety must know well the characteristics of each and every species he eats and let strictly alone everything which he does not know to be edible.

However, the necessary knowledge is neither extensive nor difficult to acquire. Any person of ordinary intelligence who is willing to put forth a moderate amount of effort may reasonably hope to become sufficiently acquainted with a considerable number of kinds of common, edible fungi to be able to recognize them almost as certainly as he does the common, cultivated plants.¹ Most cases of fatal toadstool poisoning result either from gross ignorance or the reckless disregard of common-sense precautions.

Acquaintancehip with the fleshy fungi should be cultivated. Every person should know at least a few of them. Altho their food value is not high they are not to be despised, particularly at the present time when food of all kinds is scarce and dear. They furnish a cheap, palatable addition to the menu. Besides, mushroom hunting is a pleasant and healthful form of recreation.

It is the purpose of this bulletin to give information concerning one of the common, wild mushrooms, the velvet-stemmed *Collybia*, the merits of which should be more generally known.

¹ The Station Botanist will cheerfully lend assistance by identifying such specimens as may be sent to him for that purpose. Specimens sent by mail should be fresh when started and packed in a stout box to prevent crushing. They should be addressed to the Experiment Station, Geneva, N. Y.

GENERAL APPEARANCE, HABITAT, RANGE AND SEASON.

The velvet-stemmed Collybia, *Collybia velutipes* (Curt.) Fr., is an agaric with a convex, reddish yellow cap, usually about an inch in diameter, and a brown, velvety stem commonly two or three inches long by one-fourth inch in diameter. The gills are white or yellowish. When wet the cap is very sticky.

It grows in dense clusters on the wood of various kinds of deciduous trees — on or about stumps, on the trunks of dead or dying trees, and on decaying logs and buried wood.

It is widely distributed thruout humid regions of the temperate zone. In New York, it is most abundant during October and November, but may be found in quantity also during periods of mild weather in winter and during May.

DETAILED DESCRIPTION OF COLLYBIA VELUTIPES.

In an article of this kind it is of the greatest importance that there be given a full and accurate description by means of which the fungus under consideration may be identified with certainty. As the basis of our account we may well use the following excellent description by Peck²: "Pileus rather thin, convex or nearly plane, obtuse, glabrous, viscid, reddish yellow or tawny; lamellæ broad, subdistant, rounded behind, slightly adnexed, white or tinged with yellow; stem firm, externally cartilaginous, stuffed or hollow, brown or tawny brown, velvety hairy when mature; spores narrowly elliptic, .0003 to .00036 of an inch long, .00016 broad.

"* * * * It is easily recognized by its viscid, tawny cap, its velvety stem and tufted mode of growth. Sometimes the cap is wholly yellowish or yellowish on the margin and darker on the central part. Because of the crowded mode of growth the caps are sometimes very irregular. The gills are rounded or deeply notched next the stem, so that they are slightly attached to it. They are whitish or white tinged with yellow. In very young plants the stem is whitish, but it soon becomes tawny or tawny brown from the development of the dense coat of velvety hairs. It is usually hollow. The caps are generally about 1 inch broad in large tufts, but in smaller or looser clusters or in scattered or single growths they

² Peck, C. H. Report of the State Botanist on edible fungi of New York 1895-1899. Memoir of the N. Y. State Mus. Vol. 3, No. 4, pp. 144-145. 1900.

are often larger. The stems vary from 1 to 3 or 4 inches long and are from 1 to 3 lines thick."

Most of the characters given in the above description are illustrated in the plates in this bulletin. These plates should be carefully examined and compared with the description.

The shape of the pileus (cap) is so plainly shown in the plates that comment is unnecessary except to point out that in young specimens the margin of the pileus is strongly inrolled. This is seen in the figure in the lower left-hand corner of Plate III and in the middle figure on the right-hand side of Plate IV. The variation in size is well shown in the plates. All figures excepting those in Plate I, fig. 1, Plate VIII and Plate X are natural size. Only occasionally are plants found with the pileus over three inches in diameter. As stated in the description, the color of the pileus is somewhat variable. Its usual color is shown fairly well in the colored plate. Several colored illustrations of *Collybia velutipes* have been published, but none of them are really good. It is believed that the colored illustration in this bulletin is as accurate as any.

The surface of the pileus is smooth. To the unaided eye it appears wholly destitute of hairs, scales, wrinkles and striations. However, a microscopic examination often reveals the presence of a few short, yellowish brown hairs.

A prominent character is the viscidity of the pileus when wet. Leaves, blades of grass and particles of dirt coming in contact with the wet surface adhere to it so tenaciously that, when dry, it is often quite difficult to remove them except by washing. The flesh of the pileus is white and its taste agreeable — never bitter or acrid.

Plates II and IV show how the plants frequently grow in dense clusters.

The shape and width of the lamellae (gills) are best shown in Plates VI and VII. It should be observed that the gills, tho strongly rounded next the stem, are not entirely free from it. The spacing of the gills, also, is shown in Plates VI and VII. They are described as "subdistant," that is, they are neither very close together nor very far apart.

Invariably, the gills are unequal in length. Many of them do not reach the stem. In some plants there are three times as many short gills as long ones and the short gills are of two lengths; in others, there are seven times as many short gills as long ones and

the short gills are of three lengths. (Plate X, figs. 5 and 6.) The number of long gills (those extending from margin to stem) commonly varies from 25 to 50, being larger in large caps than in small ones. The short gills are often flexuous. Forked gills occur occasionally.

The edges of the gills, which under the microscope appear truncate in cross section, are beset with numerous hyalin, lanceolate cystidia. Similar cystidia occur, sparingly, also along the sides of the gills. (Plate X, fig. 3.) The spores are white, narrowly elliptic, $4 \times 7.5-9 \mu$.

“White or white tinged with yellow” describes well the color of the gills. At first, the gills are white, but they gradually become slightly yellowish with age. In very old specimens they may be decidedly yellow. The specimens shown in the colored plate are thoroly mature and the gills somewhat more yellow than usual.

A good idea of the usual appearance of the stem may be obtained from Plate I, fig. 2, and the colored plate. In mature plants the stem is covered with short brown hairs which give it a velvety appearance. This is most pronounced on the lower portion of the stem. The upper part of the stem is often very light in color and the stems of young plants may be white or yellowish white thruout.

TERATOLOGICAL FORMS.

IRREGULAR DOUBLE GILLS.

On December 10, 1911, the writer found three malformed plants of *Collybia velutipes* among a large number of normal ones growing in a cluster at the base of a dead willow tree. A week later, in the same place, ten additional plants were found showing the same malformation to a greater or less extent.

The malformation was one affecting the gills. Instead of being straight and even on the edge like a knife-blade, as is the case with normal gills, they were irregular and double-edged, with numerous lateral projections and a strong tendency to anastomose. (Plate IX, fig. 1.)

Apparently, this condition is rare. Altho, occasionally, specimens have been found showing traces of irregular, double-edged gills no other well-marked case has come to the writer's attention among the large mass of material examined during the past six years.

EXPLANATION OF PLATES.*

PLATE I.—Fig. 1.—A cluster of *Collybia velutipes* on an exposed root which shows at the right. The white objects in front and at the left are patches of snow. Altho the photograph was taken on January 16, after a period of zero weather, the mushrooms were in prime condition. About one-seventh natural size.

Fig. 2.—A typical cluster of *Collybia velutipes* showing the velvety appearance of the stems. Natural size.

PLATE II.—Fig. 1.—A dense cluster of small plants from the base of a stump. Natural size.

Fig. 2.—Surface view of a typical cluster of plants of average size. Natural size.

PLATE III.—Clusters of small plants. The cluster in the lower left-hand corner shows how the margins of young caps are inrolled. Collected and photographed January 13, 1916. Natural size.

PLATE IV.—Clusters of young plants. In the upper left-hand corner a dense cluster on a piece of bark; in the upper right-hand corner a loose cluster on a piece of bark; in the lower left-hand corner a typical fan-shaped cluster from beneath loose bark on a stump; in the middle on the right-hand side a cluster showing the inrolling of the margins of young caps. All natural size.

PLATE V.—Caps of medium and large size. Occasionally, caps larger than the one at the bottom of the plate are found, but they are not common. Natural size.

PLATE VI.—Form and structure of *Collybia velutipes*. The cluster at the top contains some very young plants. In the middle of the plate are three plants split lengthwise to show the shape of the gills and their mode of attachment to the stem. The two caps at the bottom show the arrangement and spacing of the gills and the hollowness of the stem. Photographed December 27, 1916. Natural size.

PLATE VII.—Group of plants showing the shape, arrangement and mode of attachment of the gills and structure of the stem. Natural size.

PLATE VIII.—Fig. 1.—Clusters of plants growing at the base of small stumps in typical fashion. About one-seventh natural size.

Fig. 2.—A basket of *Collybia velutipes* collected January 11, 1916. At the right of the basket is a stump with a cluster of *C. velutipes* at its base. About one-seventh natural size.

PLATE IX.—Fig. 1.—Cap of *Collybia velutipes* with irregular, double-edged gills.

Fig. 2.—Cap of *C. velutipes* with normal gills. Both figures natural size.

PLATE X.—Fig. 1.—Conidiophores and conidia of *Diplocladium minus* Bonord.

Fig. 2.—Conidiophores and conidia of *Cladosporium fuligineum* Bonord.

Fig. 3.—Cystidia from the edge of a gill of *Collybia velutipes*.

Fig. 4.—Spores of *Collybia velutipes*.

Fig. 5.—Diagram showing the 3-to-1 arrangement of short and long gills in *Collybia velutipes*.

Fig. 6.—Diagram showing the 7-to-1 arrangement of short and long gills in *Collybia velutipes*.

* Plates I-VIII, inclusive, are from photographs by F. S. Emmett and Plate IX from a photograph by G. T. French. Plate X is from drawings by the author.



PLATE I.—CLUSTERS OF *Collybia velutipes*.
(See page 84.)



PLATE II.—CLUSTERS OF *Collybia velutipes*.
(See page 84.)



PLATE III.—CLUSTERS OF SMALL PLANTS OF *Collybia velutipes*.
(See page 84.)



PLATE IV.—CLUSTERS OF YOUNG PLANTS OF *Collybia velutipes*.
(See page 84.)

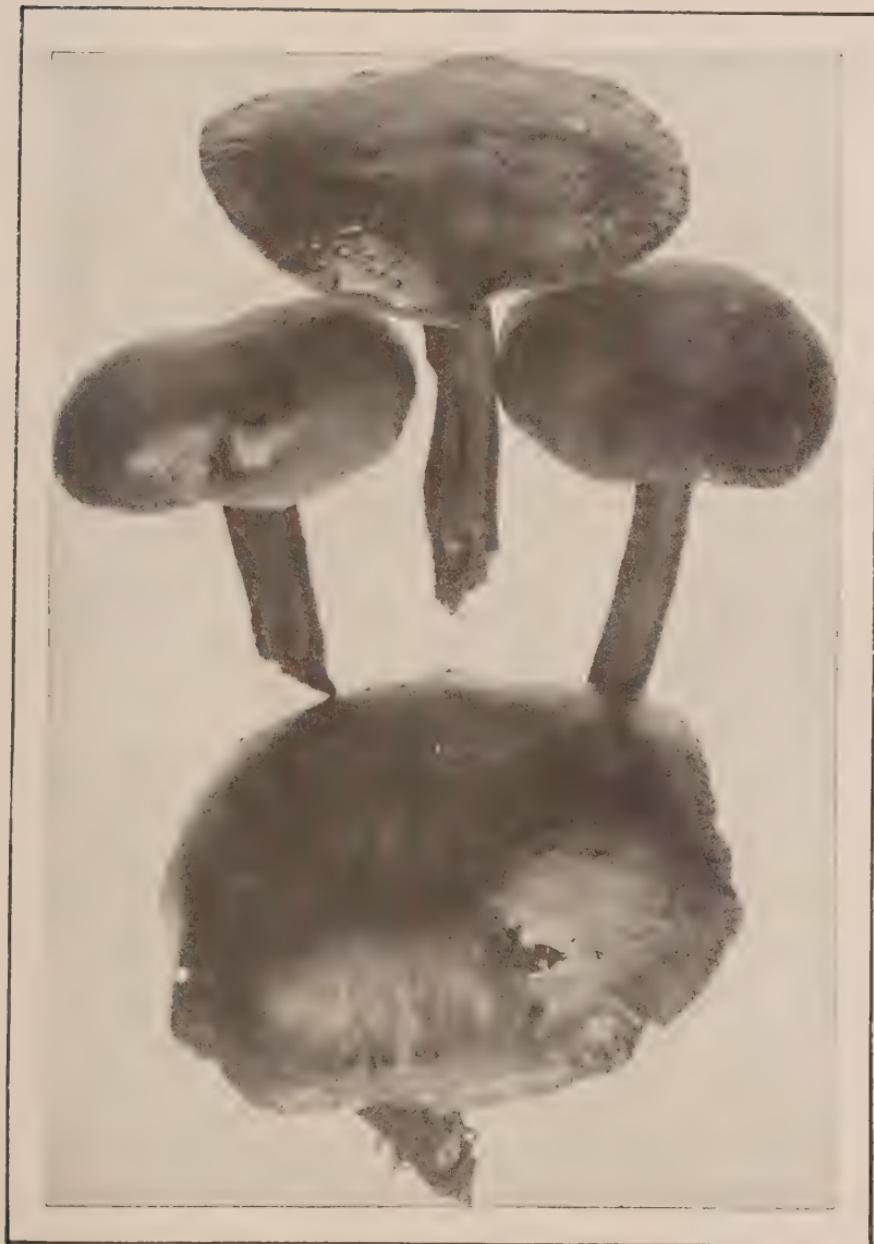


PLATE V.—MEDIUM AND LARGE SIZED CAPS OF *Collybia velutipes*.
(See page 84.)



PLATE VI.— FORM AND STRUCTURE OF *Collybia velutipes*.
(See page 84.)

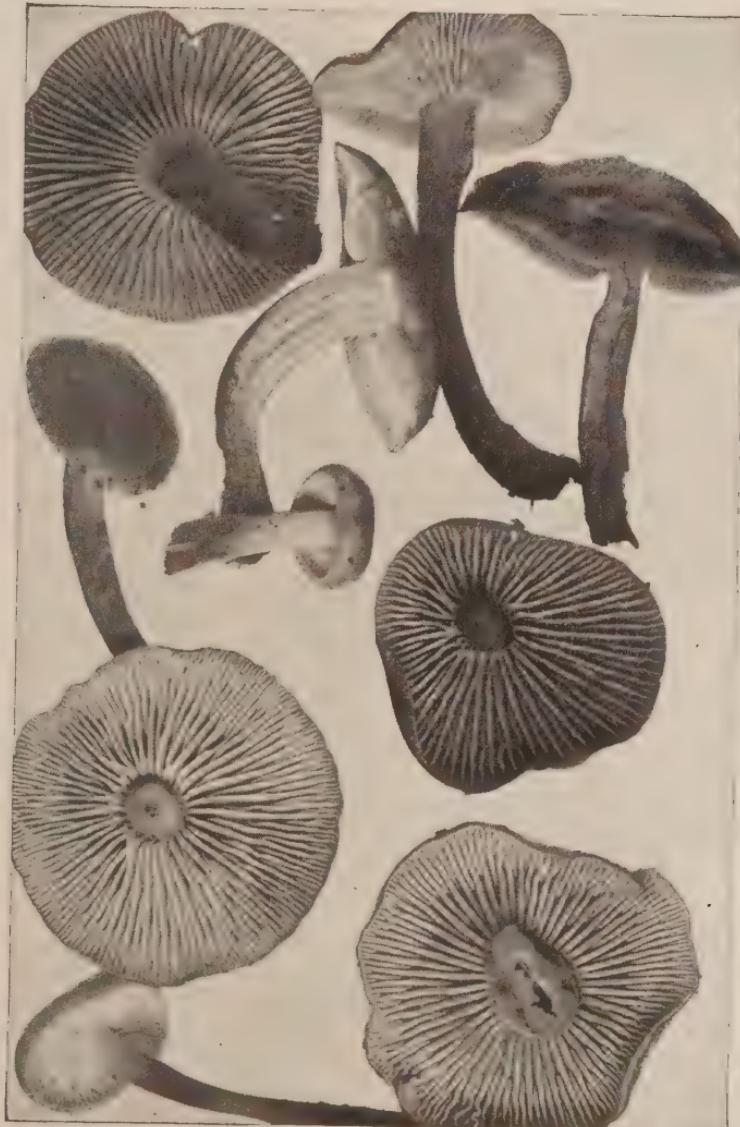


PLATE VII.—STRUCTURAL DETAILS OF *Collybia velutipes*.
(See page 84.)



PLATE VIII.—GROWING AND COLLECTED PLANTS OF *Collybia velutipes*.
(See page 84.)

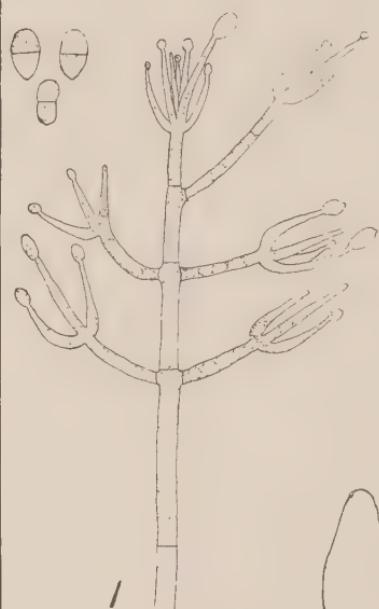


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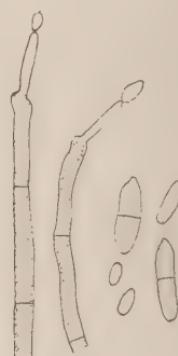


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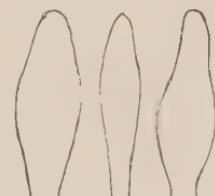
PLATE IX.—*Collybia velutipes* WITH ABNORMAL AND NORMAL GILLS.
(See page 84.)



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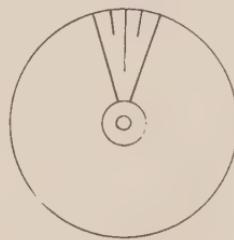
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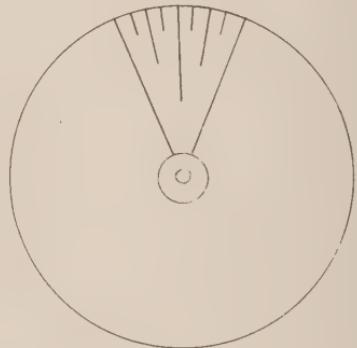
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PLATE X.—FRUITING ORGANS OF FUNGI AND GILL ARRANGEMENT OF *Collybia velutipes*.
(See page 84.)

SPOROPHORES FROM GILLS.

On a prostrate elm trunk at Ithaca, N. Y., the writer once found a robust young sporophore of *Collybia velutipes* with four small sporophores forming on its gills. The pilei of the secondary sporophores were perfect in form, but almost sessile. Three of them were 2 mm. in diameter while the fourth was smaller. With the aid of a hand lens the gills were readily distinguishable. No evidence of mutilation of the gills of the primary sporophore was detected. Brefeld has described and illustrated a similar phenomenon in *Coprinus stercorarius* which he produced by wounding the plants when very young.³

HABITAT.

Collybia velutipes grows on the wood of many kinds of deciduous trees, but not on conifers. Elm and willow are favorite hosts. Wherever stumps of these trees are plentiful good collecting may be expected. The favorite place of growth is on stumps at or near the soil line; but clusters are often found emerging from cracks in the bark at considerable distance above the ground. On the standing trunks of dead or dying trees, particularly elms in damp situations, the fungus may be found at a height of several feet. Prostrate trunks of elm and willow often yield large quantities. Also, partially buried wood and the partially exposed surface roots of stumps and dead trees are common places of growth for *C. velutipes*.

Our observations indicate that *C. velutipes* prefers wood in a comparatively early stage of decay. It is of little use to look for it on stumps or logs in an advanced stage of decay. The fungus is to be sought in new stump lots rather than in old ones. A stump may bear several crops each year for several years in succession and then cease to bear altogether.

In a pasture near Geneva, stumps of trees four to ten inches in diameter, cut in the winter of 1910-1911, began to bear a little in the autumn of 1912 and have borne good crops each year since. The trees were elm, beech, basswood and sugar maple. Older stumps of the same kind in an adjacent portion of the same pasture bore fairly well in 1911 and 1912 and produced a small crop in 1913, but

³ Brefeld, O. Untersuchungen aus dem Gesamtgebiete der Mykologie. III. Botanische Untersuchungen über Schimmelpilze. Basidiomyceten I, pp. 72-75. Leipzig. 1877.

none at all since. Apparently, the older stumps have passed their bearing age. Nothing is known of their history prior to 1911.

PARASITISM.

The preference shown by *C. velutipes* for the wood of newly-killed trees is in harmony with its semi-parasitic habit. The fungus is frequently found on the trunks of living trees, particularly those of elm and willow, and has often been suspected of being parasitic under certain conditions.⁴ Münch and others have reported successful infection experiments with it.⁵

SEASON.

The velvet-stemmed *Collybia* is a cool-weather mushroom. It is useless to look for it in summer. Between June 15 and September 15, in this latitude, only occasional specimens are found — very rarely is the quantity sufficient for cooking. October and November are the best months for it. At Geneva, the first week in November may be considered the height of the season. It may be found in quantity, also, during spells of open weather in December, January and February. During March and April it is scarce; but considerable quantities may be collected again in May if the weather is wet and cool.

Because of its ability to endure low temperatures *Collybia velutipes* has sometimes been called "the winter mushroom." In this respect it is unique. With us, it is the only wild mushroom obtainable in quantity during winter. It may be frozen solid for days without affecting its quality or its ability to resume growth upon the return of mild weather. In fact, it may freeze and thaw several times without material injury to its esculent properties. During the past six years the writer has made fourteen winter collections, varying in amount from twenty to ninety ounces of cleaned caps, on the following dates: December 7 and 10, 1911; December 7, 1912; January 26, February 22 and December 24, 1913; February 7, 1914; February 22 and December 25, 1915; January 11, 13 and 31, 1916; and January 7 and February 28, 1917. One of these winter collections is shown in Plate VIII, fig. 2.

⁴ Hennings, P. Die an Baumstämmen und Holz auftretenden teilweise parasitären heimischen Blätterschwämme. *Ztschr. Pflanzenkr.* 13:204. 1903.

⁵ Münch, E. Versuche über Baumkrankheiten. *Naturw. Ztschr. Forst- u. Landw.* 8:389-408, 425-447. 1910.

Apparently, the plant is capable of growth at temperatures but slightly above freezing. Probably, it grows at any time when the ground is not frozen; but there is no reason to believe that it makes any growth while frozen. The observations recorded in the next three paragraphs bear on these points.

In December, 1914, at Geneva, there was a heavy fall of snow on unfrozen ground. The snow remained thru January and the first half of February. Then there came a spell of warm weather during which the snow melted rapidly leaving the ground bare except in places here and there where there had been deep drifts. On February 22, immediately after the disappearance of the snow, the writer gathered ninety ounces of caps of *Collybia velutipes* on an area of about two-thirds of an acre which had been thoroly searched and every cap of edible size removed only a few days before the snowfall in December. The *Collybia* plants must have grown under the snow during the winter. Some were considerably browned, others perfectly fresh; but nearly all were still in edible condition. Some, in prime condition, were taken from under the edges of melting snowbanks.

In 1917 a cluster of *Collybia velutipes* on a small willow stump was kept under observation from January 7 to March 22. During the greater part of this time the plants were covered with a few inches of snow; but they were also exposed at intervals. Except for a few brief periods the plants were frozen continuously from January 9 to February 26. Part of this time the weather was extremely cold. On six days the minimum temperature was below zero. One day, zero temperature was accompanied by high wind.

At the beginning of the observations the largest caps were one-half inch in diameter. They were but slightly larger on February 26, fifty days later. Then the weather became a little warmer and it rained. The caps started to grow. By March 11 they had attained a diameter of a trifle over an inch and appeared to be in prime condition; but from this time on they deteriorated. Tho still in edible condition on March 22 they were brown and dry on the margin and it was evident that they would not revive again.

MOISTURE RELATIONS.

The yield of *C. velutipes* is largely dependent upon moisture conditions. During periods of dry weather one may expect to find it only in damp situations and in small quantity. Collections made

in dry weather are usually very disappointing. On the other hand, in excessively wet autumns it grows abundantly on stumps, logs and dead wood in all sorts of situations. Ideal conditions for it are furnished when a heavy shower is followed by a few days of drizzling rain with the temperature around 40-60° F. After about a week of such weather (which is most likely to occur in October or November) good collecting may be expected.

Compared with some of the common warm-weather mushrooms *Collybia velutipes* is of slow growth. It does not appear suddenly after showers like the meadow mushroom, *Agaricus campestris*, but requires several days to reach maturity.

Caps of *C. velutipes* which have become shriveled during dry weather absorb water and partially revive when moistened. In this respect they resemble, considerably, the caps of the fairy ring mushroom, *Marasmius oreades*. Further discussion of this subject will be found on page 95.

QUALITY AND ECONOMIC ASPECTS.

As an esculent, *Collybia velutipes* has much to recommend it; but it possesses, also, a few objectionable features. In the first place, it may be said to be a fairly safe fungus. It bears little resemblance to any of the common poisonous species. Besides, it comes at a season when poisonous species are scarce.

Its flavor is excellent. Most mushroom eaters of the writer's acquaintance pronounce it first class. A few dislike the slippery condition due to the viscidity of the caps. However, this fault may be largely overcome by thoro cooking.

Its consistency, also, is entirely satisfactory. The caps are firm, but never tough no matter how old they may be. When properly cooked they are palatable and easily digestible. The stems, being tough, are never used.

The wide distribution and abundance of the fungus make it obtainable in quantity by large numbers of people. The plants are not large; but they grow in clusters which are often of considerable size and successive crops of them may be found in the same place year after year during their season.

Since they appear principally in cool weather they are not often seriously infested by worms or insects. Trouble with worms is confined chiefly to collections made during the forepart of October

and the latter part of May when the temperature is relatively high. At other times worms are scarce or entirely lacking. However, owing to the long duration of the caps under favorable conditions, wormy ones are occasionally found even in midwinter. On January 7, 1917, the writer found a few caps which, tho fairly fresh in appearance, contained live worms.

Another desirable quality due to the season of the fungus is the long time which it may be kept. Most mushrooms must be cooked within 24 hours after being gathered because they decay so quickly; but *Collybia velutipes* may be kept a week during the cool fall weather and still longer during the freezing weather of winter.

The most objectionable feature of the fungus is its viscidity. This makes it disagreeable to handle when wet and causes the adherence of leaves, grass and dirt which must be removed before cooking. The small size of the caps makes the cleaning process a slow one.

No attempt at the cultivation of *Collybia velutipes* is known to the writer. On account of its small size and the fact that it requires large quantities of decaying wood it appears improbable that it would be practicable to grow it in mushroom houses as the common *Agaricus campestris* is grown. But it might, perhaps, be grown out-of-doors on stumps. Since the fungus has its origin in spores it seems reasonable to expect that it might be encouraged to grow on stumps by placing about them the spore-laden caps and refuse which are unfit for cooking. It is worth trying. Stumps of elm and willow are the best subjects for experiments along this line. The writer has begun such experiments, but it is yet too early to expect results from them.

Taking all things into consideration, *Collybia velutipes* ranks high as an edible fungus of economic importance. It should be better known and more generally utilized.

METHODS OF GATHERING.

Under this head little need be said except to indicate the tools needed. During his rambles, the enthusiastic mycophagist always carries in his pocket one or two paper bags to hold any edible fungi which he may chance to meet. But when he goes on a real mushroom hunt he takes a basket and a large knife. All things con-

sidered, a covered ten-quart basket like the one shown in Plate VIII, fig. 2, is, perhaps, the most satisfactory. However, an uncovered basket is more convenient and one of larger size is often needed.

For the rapid and easy collection of *Collybia velutipes* one needs a knife with a long, sharp, flexible blade which may be run beneath the clusters to separate them from the stump or log upon which they are growing. If such a knife is not available a large pocket-knife will answer the purpose very well. Also, a pair of scissors may be used. Some tool with which to sever the stems is almost a necessity since they are very tough and attempts at breaking them result in severe mutilation of the caps.

Wormy, moldy and decaying specimens should be rejected. However, while collecting in the late fall and winter one often finds specimens which, tho much browned from repeated freezing and thawing, are, nevertheless, perfectly good. Also, in dry weather the caps may be much shriveled without loss of edibility. When washed, they absorb water and recover their freshness and turgidity.

CONFUSION WITH OTHER SPECIES.

REJECTION OF UNKNOWN SPECIMENS.

In gathering mushrooms of any kind for table use one should make it an invariable rule to *reject all unknown and doubtful specimens* no matter how inviting they may appear. This is best done in the field. Mutilated specimens are difficult to identify and when an attempt is made to sort mixed collections there is always danger that some of the "unknowns" may be overlooked and find their way into the frying pan. Mixtures gathered by children and uninformed persons are dangerous unless thoroly inspected by an expert.

During a large part of the season for *Collybia velutipes* other kinds of fleshy fungi are very scarce. This fact greatly facilitates its identification and, to a large extent, obviates the danger of confusing it with poisonous species.

SPECIES OF AMANITA.

The deadly poisonous species of Amanita, besides being very different from *C. velutipes* in color, grow singly instead of in clusters; also, the stem is surrounded at the base by a sort of cup called the

volva, and, higher up, it bears a ring, or annulus. *C. velutipes* has no trace of either a volva or an annulus. Only a very careless or a very stupid person would mistake an *Amanita* for *Collybia velutipes*. The writer has never observed any species of *Amanita* actually growing in company with *Collybia velutipes*. However, such association is entirely possible. *Amanita mappa* Fr., a species with a straw-colored or pale yellow cap, occurs frequently in the woods of central New York all thru October; and the writer has found occasional specimens of *Amanita porphyria* Fr. at Ithaca as late as October 31.

CLITOCYBE ILLUDENS.

Clitocybe illudens (Schw.) Fr. is a showy, yellow fungus which grows in clusters about stumps. Its season being from July to October it is occasionally encountered early in October by persons seeking *Collybia velutipes*. However, it is quite a different fungus. It is considerably larger than *C. velutipes*, the caps being three to six inches in diameter and the stems three to six inches long. Also, it is of rich saffron-yellow color thruout and the gills are decurrent, that is, they extend downward on the stem. While this fungus is not poisonous it should be avoided because some persons are made sick by eating it.

ARMILLARIA MELLEA.

Armillaria mellea (Vahl.) Quel. is one of the few fleshy fungi which the collector of *Collybia velutipes* is sure to meet. It grows in much the same sort of places as *C. velutipes* and is very common during October. As this is an edible species (tho of second quality) fungus-eaters should make its acquaintance. However, the scope of this bulletin does not permit of a detailed description of it. For our purpose it is sufficient to indicate how it may be distinguished from *C. velutipes*. The cap of *C. velutipes* is smooth and very viscid when wet, while the cap of *A. mellea* is more or less covered with scales consisting of tufts of short hairs and is never viscid. The stem of *C. velutipes* is always without an annulus; that of *A. mellea* occasionally lacks an annulus, but usually bears one of cottony texture. *A. mellea* is an extremely variable species. Usually, it is yellowish brown and considerably larger than *C. velutipes*. It is unlikely that anybody who has once recognized *C. velutipes* would mistake *A. mellea* for it; but no harm would be done if the two species should be confused.

HYPHOLOMA SUBLATERITIUM AND H. PERPLEXUM.

The brick-top, *Hypholoma sublateritium* (Schaeff.) Fr., is another common edible fungus which is found during a portion of the season for *Collybia velutipes* and in similar situations. It grows in large clusters on the ground around stumps and over buried wood during October and November. The caps are fleshy, brick red at the center and paler around the margin. Usually, this is much larger and stouter than *C. velutipes*, the caps being two to five inches across and the stems one-half to three-fourths of an inch in diameter; but small specimens, when viewed from above, sometimes resemble *C. velutipes* so closely as to deceive even the experienced collector. In doubtful cases the color of the gills establishes the identity of the fungus at once. If the gills are white or yellowish white it is *C. velutipes*; if they are greenish yellow, sooty, olivaceous or purplish brown it is either *Hypholoma sublateritium* or a closely related species, *Hypholoma perplexum* Pk. Since both of these species are edible an error in identification would have no harmful result.

COPRINUS MICACEUS AND HYPHOLOMA APPENDICULATUM.

While collecting *Collybia velutipes* in May the writer has often taken large quantities of the inky cap (*Coprinus micaceus* (Bull.) Fr. and *Hypholoma appendiculatum* Bull. (= *H. incertum* Pk.) These two species are edible. Also, they are so different from *C. velutipes* that even a novice would not confuse them with it.

PREPARATION FOR COOKING.

The preparation for cooking consists of: (1) The removal of the stems; (2) the removal of leaves, grass and other rubbish adhering to the caps; (3) separating out wormy, decaying and moldy specimens; and (4) washing. In general, the first three of these operations should be performed the same day the mushrooms are gathered while the fourth is best done just before cooking.

The writer has found the following methods satisfactory: A newspaper is spread on a table and the mushrooms dumped onto it in a pile. Two dishes are provided — one for the good caps, the other for the refuse. A good light is desirable, particularly if some of the specimens are wormy. With a pair of scissors the stems are severed close up to the cap; or, the stems of the larger caps may be broken

out. When worms are present the latter is the better method since it is necessary to break open the caps to look for worms. The larger pieces of leaves and grass adhering to the caps are picked off with the fingers; but small pieces may be left to be removed in the washing. If the mushrooms are the least bit damp the viscid substance on the caps causes the fingers to become sticky and dirty making it necessary to wash the hands every few minutes.

Just before cooking, the caps are thrown into a large pan of water and vigorously stirred and rubbed between the hands for about a minute after which they are lifted out. The dirty water is then thrown away, a quantity of clean water placed in the pan and the washing process repeated. Usually, two washings are sufficient, but a third may be necessary if the specimens are very dirty or have not been carefully freed from grass. Occasional caps which are very dirty will require individual attention, but most of the washing is done *en masse* and need not take more than five minutes altogether. The small and medium-sized caps may be cooked whole, but the larger ones should be cut into pieces. Peeling of the caps, as recommended by Peck,⁶ is not only unnecessary but impracticable.

COOKING.

There are several ways of cooking mushrooms. Doubtless, *Collybia velutipes* may be made into an appetizing dish by any one of several different methods known to skilful cooks. An authoritative discussion of these methods would form a valuable addition to this bulletin. Unfortunately, the writer's experience in the cooking of mushrooms is confined almost exclusively to a single method, namely, that of frying. Accordingly, he must content himself with giving an account of his method of frying *Collybia velutipes*.

After the caps have been washed as described on a previous page they are placed in a frying pan over the fire and salted. The caps are then boiled until the water which they contain has almost all evaporated. The boiling process should consume about thirty minutes. If the boiling proceeds slowly the water contained in the

⁶ Peck (*Loc. cit.*, p. 145) says: "It is well to peel the caps before cooking in order to free them from adhering particles of dirt or other objectionable matter." It is incomprehensible that one so well acquainted with edible fungi as Dr. Peck should make a recommendation so impracticable. The "peel" is very thin and so tender that careful manipulation is required to remove it. It would be a large task to peel enough caps for a meal for a family. No cook could be induced to try it a second time.

caps is sufficient; but with rapid boiling it will be necessary to add a little water to prevent burning before the end of the half-hour period.

When the boiling is completed butter, oleomargarin or bacon fat is added and the caps are fried over a brisk fire for about fifteen minutes. Frequent stirring is required to prevent burning. While the frying is in progress pepper is added for seasoning.

In case of necessity the whole process of cooking may be brought within half an hour, but better results are likely to be had when more time is taken. If not boiled long enough the caps are somewhat tough. If not fried long enough they will be slippery. They may be served as a separate dish or on toast.

This simple method of cooking is highly satisfactory for *Collybia velutipes*. In fact, it is one of the best methods for cooking mushrooms of almost any kind; but, of course, it must be varied somewhat to suit the requirements of different species.

PRESERVATION BY CANNING AND DRYING.

Altho the writer has never attempted to can *Collybia velutipes* and knows of nobody who has done it, he is confident that the fungus may be canned successfully by the methods used in canning other kinds of mushrooms.

The writer's experience with the drying of *Collybia velutipes*, also, is limited, yet sufficient to convince him that this method of preserving the surplus is entirely practicable and probably more satisfactory than canning. Of course, the dried article is not quite as palatable as that freshly gathered; but the difference is not great.

Specimens selected for drying should be such as can be made reasonably clean without washing. The washing must be postponed until a short time before cooking. On account of the large quantity of water taken up in the process of washing, washed caps are difficult to dry. The writer once washed a quantity of caps and then attempted to dry them in a shallow pan on top of the warming oven of a kitchen range. Altho uncovered and spread in a thin layer the caps became partially cooked and dried down into a shapeless black mass having an offensive odor.

Subsequently, excellent success was had with unwashed caps dried more slowly. After the removal of the stems and adhering bits of rubbish the caps were put into an open dish which was placed near

the kitchen ceiling about five feet above and a little to one side of the cook-stove. At the end of a week the caps were transferred to a closed paper bag which was left in the same place five weeks longer. During this time the caps lost 89 per cent. of their weight and became thoroughly dry. Doubtless they would have kept here in good condition all winter, but it being desired to test their edible properties they were prepared for cooking. After soaking in cold water for three hours they were softened and swollen sufficiently for washing, but did not regain their original turgidity by considerable. While cooking they appeared much like fresh specimens and their palatability was but slightly inferior to that of fresh specimens.

Once, during winter, the writer left a quantity of *C. velutipes* in an unheated room for over three weeks. The caps became dry and shriveled but did not decay in the least. After being soaked and washed they were cooked and found to be of good quality.

It seems probable that drying might very well be commenced in the sun and completed over a stove. An ounce of dried caps is equivalent to from ten to fifteen ounces of fresh ones.

CAPACITY OF THE CAPS FOR THE ABSORPTION OF WATER.

On previous pages brief mention has been made of the fact that shriveled caps of *Collybia velutipes* become turgid when moistened. They possess a remarkable capacity for the absorption of water. Under different conditions their water content varies so much that it is impossible to express it accurately in terms of percentage. This was brought out very clearly in some simple experiments made by the writer.

FIRST EXPERIMENT.

A quantity of caps⁷ weighing 23 ounces when first collected in the latter part of October weighed only 2.5 ounces after six weeks of drying in a paper bag hung near a cook-stove. Thus their water content appears to have been approximately 89.1 per cent. These caps were rather dry, but only slightly shriveled when gathered.

⁷ In all of these experiments only clean, edible caps were used. The stems had been removed by cutting them off close to the caps.

SECOND EXPERIMENT.

In January, a quantity of fresh caps in prime condition weighed 19.5 ounces when first gathered. After being weighed they were put into a pan of cold water and washed, then transferred to a colander to drain. During the process of draining they were removed from the colander three times and thoroly mixed in order to give opportunity for the escape of water caught between the gills. The draining was continued for several minutes after water ceased to drip from the bottom of the colander. The caps were then weighed a second time and their weight found to be 34 ounces. During the process of washing their weight had increased 74.3 per ct.

THIRD EXPERIMENT.

Another collection made on the same date as the above, but in a different locality, contained some specimens which were quite old and a few shriveled ones; but all were in edible condition. This lot weighed 13.5 ounces when first gathered and 28 ounces after being washed and drained as described in the second experiment. In this case there was an increase in weight of 111.1 per ct.

FOURTH EXPERIMENT.

A November collection containing many shriveled caps weighed 20.5 ounces when first gathered and 47 ounces after being washed and drained. In this case the increase in weight equalled 131.7 per ct. Caps which were much shriveled at the time of the first weighing appeared plump and fresh at the second one.

FIFTH EXPERIMENT.

Forty ounces of caps collected February 28, 1917, were divided into two equal lots which were washed and drained separately as described above. When weighed a second time the two lots had exactly the same weight, namely, 27.75 ounces. Hence, washing increased their weight 35.7 per ct. Many caps of both lots were frozen and some were much browned at the time of the first weighing, but all were in edible condition.

DISCUSSION OF THE RESULTS.

In the above experiments the increase in weight which resulted from washing is due entirely to water taken up; but it is unknown

how much of the water was actually absorbed into the tissues and how much adhered to the surface. The gills present a large area of surface to hold water by adhesion. However, the fact that shriveled caps became turgid is proof positive that some water was absorbed. Also, it appears that the wide variation in the amount of water taken up in the four experiments was due chiefly to differences in the absorptive power of the caps, because there seems to be no good reason for believing that different lots of caps should vary much in their capacity for holding water by adhesion.

WHITE MOLD.

When gathering *Collybia velutipes* for table use one often finds specimens infested with a cottony white mold which covers large areas on the gills and stem. Altho such specimens may not be old ones they should be rejected because the moldy parts are brown and decayed. Sometimes large clusters appearing sound externally are so overgrown with mold on the interior as to be almost entirely worthless. Moldy specimens are most plentiful during October and May when the weather is comparatively warm; but some are found even in winter. Once the writer found several on February 22 in such fresh condition as to make it appear probable that both the mold and its mushroom host were of recent growth.

In the great majority of cases microscopic examination of the mold when first collected fails to reveal the presence of spores other than those of the mushroom. However, the mold sporulates freely in a moist chamber. When a fresh cap with a spot of mold on its gills is put into a moist chamber and subjected to a temperature of about 70° F. the entire cap becomes overgrown with the mold in from two to four days. The growth of mold is loose, snow white, very luxuriant (one-fourth to one-half inch high) and covered with multitudes of spores which are hyalin, egg-shaped, two-celled and measure 15-20 x 7-9 μ . The spores are borne singly on the tips of club-shaped branches which have a verticillate arrangement. (Plate X, fig. 1.)

This white mold is a species of *Diplocladium* — either *D. majus* Bonord. or *D. minus* Bonord. Apparently, these two species are very similar. Both are said to occur on decaying agarics and polypores belonging to several different genera;⁸ but the writer has observed the mold described above only on *Collybia velutipes* and it

⁸ Lindau, G. Rab. Krypt. Fl., Zweite Aufl., 1⁸: 373. 1907.

seems to be parasitic. Peck mentions the occurrence of *Diplocladium minus* on "decaying agarics and polypori" in the Helderberg mountains of eastern New York.⁹

A second white mold is sometimes found on *Collybia velutipes*. In the field its appearance is similar to that of *Diplocladium*, but in moist chamber it is readily distinguished by its much slower and less luxuriant growth. It has never been observed to produce spores. Its identity has not been determined.

OLIVE GREEN MOLD.

Among a lot of caps collected May 6, 1917, there was one the upper surface of which was covered with dark-colored elevations. The appearance of these elevations under a hand lens suggested fungus stromata imbedded in the flesh of the mushroom; but upon examination of sections under a compound microscope they were found to consist of a compact layer of the unbranched conidiophores of some fungus. Some of the conidiophores bore immature conidia on their tips and a few free, one-celled and two-celled conidia were in evidence. After being 16 hours in a moist chamber the entire surface of the cap was olive green with multitudes of conidia which were mostly one-celled. Two days later, after the specimen had been allowed to dry, many two-celled conidia were found. The conidia were very variable in size, the larger ones measuring $15-20 \times 7 \mu$. The conidiophores have a peculiarity which should be of assistance in the identification of the fungus. A short distance below the tip there is an abrupt enlargement. Above this enlargement the conidiophore is hyalin; below it, colored. (Plate X, fig. 2.) The fungus has been identified as *Cladosporium fuligineum* Bonord.¹⁰ It appears to be parasitic.

SLUGS, MILLIPEDS AND ANIMALS.

A great many caps are mutilated by slugs which feed upon them freely. Frequently specimens are found with the gills almost entirely eaten away. During cold weather millipedes or thousand legged worms congregate in clusters of the caps and probably feed upon them to some extent. The writer has sought, but never found, evidence that the caps of *Collybia velutipes* are eaten by animals. Even sheep in close-grazed pastures do not molest them.

⁹ Peck, C. H. Report of the Botanist. N. Y. State Mus. Rpt. 34: 48. 1883.

¹⁰ Bonorden, H. F. Abhandlungen aus dem Gebiete der Mykologie I, p. 92. Halle, 1864.

